Specification

Foot Movable Mechanism and Brake in Skating

Technical Field

The present invention relates to, in a sporting gear such as a roller skate or in-line skate, connection of a frame which supports wheels and a shoe or a plate for mounting the shoe, and a brake.

Background Art

Conventionally, a shoe or a plate for mounting the shoe, and a frame which supports wheels are connected mainly integrally or uniaxially. As a brake mechanism, one is mainly used in which stationary rubber members are attached to the front and rear portions of a sporting gear to urge the sporting gear against the ground. Another brake mechanism is also known with which the skater bends his ankle forward or backward to brake the wheel by using a wire or rod.

With such a sporting gear, particularly a beginner often loses his balance during skating to fall. Even when the skater loses his balance only slightly, the wheels rotate undesirably and the skater's leg slides forward or backward, leading to a fall. To prevent the fall, the slight loss of balance must be detected. When the wheels are to rotate whether forward or backward against the skater's will, the rotation must be stopped immediately to prevent the skater from

falling, which is the problem.

Disclosure of Invention

In order to solve this problem, according to the present invention, first, as a multi-shaft mechanism, two or more shafts are provided to a shoe or a plate for mounting the shoe, or a frame which supports wheels. The shoe or plate and the frame are connected to each other through the shafts. The mechanism is incorporated which enables the shoe or plate to move like a pendulum relative to the frame about the shafts as fulcrums.

With the multi-shaft mechanism, the skater can lower his two heels simultaneously, or open his legs apart forward and backward and lower and raise the heels of the front and rear legs respectively, to brake with the two feet simultaneously.

When the skater raises the heel of his rear leg, he may raise the heel to a predetermined angle or more and then brake with the toe, so that he can brake with his barycenter being lowered as in the telemark style of ski jump.

With the multi-shaft mechanism, preferably, the shafts are divided into the front and rear portions of the foot such that the front shaft is located near the ball of the foot or on its front side. Then, the skater can raise his heel and strike strongly with the ball of the foot. Also, stability during skating can be ensured.

The rear shaft is located at such a position that the skater can brake by lowering his heel about the shaft as the fulcrum. Preferably, the rear shaft is located near the ankle of the foot or on its rear side. Then, stability during skating can be ensured.

Also, a groove and projection are provided for guiding a shaft that stabilizes the pendulum-like motion of the shoe or plate.

Furthermore, a hinge-like movable plate is added to one shaft. The hinge-like plate serves as a guide to further stabilize the pendulum-like motion.

A one-way rotary mechanism is incorporated between the frame and wheel to prevent reverse rotation of the wheel, so the hind leg will not slide backward until its toe starts serving as a brake. This supplements the braking operation of the multi-shaft mechanism.

A spring is incorporated to restore the shoe or plate to the skating position. When raising the leg, the frame will not hang undesirably. During skating, the spring brings the foot into tight contact with the frame. Thus, the skater can maintain a stable posture during stopping or skating, and kick or brake stably.

A link mechanism, or a belt, chain, wire, or the like is provided to connect and interlock front and rear brakes with each other. Part of the link mechanism or the like is pushed or pulled by raising and lowering

the heel to render the front and rear brakes operative simultaneously. As a result, the brake can be rendered operative more reliably.

The mechanism in which the front and rear brakes are connected to each other by the link mechanism, or by the belt, chain, wire, or the like in this manner so that the front and rear brakes are braked simultaneously will be referred to as a brake interlocking mechanism hereinafter.

With the multi-shaft mechanism, one-way rotary mechanism, and brake interlocking mechanism, when the skater loses his balance or intends to brake, he can brake with his two feet simultaneously by lowering or raising his heels.

Even when the brake of one foot wears and does not work effectively, the skater can brake with the other foot, thereby improving the safety significantly.

With the multi-shaft mechanism, when braking, the skater may lower or raise the heel, or raise the heel and lower the toe, to urge the brake rubber against the ground or push or pull part of the brake interlocking mechanism.

In the brake interlocking mechanism, a brake shoe is urged against the wheels, or drums or disks integral with the wheels, thus enabling braking. The brake interlocking mechanism can perform adjustment so that braking is rendered operative even with a slight

loss in balance or by foot operation.

In this manner, the front and rear wheels can be braked simultaneously by the brake interlocking mechanism. Thus, all the wheels can be braked, so that braking can be rendered operative more reliably. The front or rear wheels alone can be braked as a matter of course.

If a mechanism which brakes only the rear wheel is provided, as in the third embodiment, when braking, the skater may raise the heel to bring the toe into contact with the frame, and further raise the heel, as shown in Fig. 10, to raise a front shaft 33 about a rear shaft 34 as a fulcrum.

If the front and rear brakes link to each other, as in this brake interlocking mechanism, a spring is incorporated in this mechanism. When braking the front and rear wheel simultaneously, the spring prevents braking only one wheel. This can adjust the balance of the tension between the front and rear brakes.

With the brake interlocking mechanism, the shoe or the plate for mounting the shoe, and the frame can be connected to each other through one shaft and be functioned. If the shoe or plate is connected and interlocked with part of the brake interlocking mechanism at a position closer to the toe than this one shaft, when the skater lowers his heel about one shaft as a fulcrum, part of the brake interlocking mechanism

can be pulled up at the connecting portion and part of the brake interlocking mechanism can be pushed down by the heel to brake the front and rear wheels simultaneously.

In the mechanism in which the front and rear brakes are interlocked with each other by using the belt, chain, or wire, the tension of the brakes to act on the front and rear wheels, or drums or disks interlocked with the wheels can be easily applied to them evenly. Thus, braking can be performed stably.

Braking can be functioned also when the front brake is connected to the toe portion of the shoe or the plate for mounting the shoe by using a belt, chain, wire, or the like, and the rear brake is connected to the heel portion. In this case, springs may be incorporated which adjust the tension of the front and rear brakes.

With the brake mechanism which uses the belt, chain, or wire, further weight reduction can be achieved.

In this manner, by incorporating the multi-shaft mechanism, one-way rotary mechanism, and brake interlocking mechanism together, braking can be applied in various methods. Even if the skater loses his balance during skating, his feet will slide neither forward nor backward undesirably but he can maintain his posture. Thus, a very stable sporting gear can be obtained.

Brief Description of Drawings

Fig. 1 is a side view of a state during skating according to the first embodiment;

Fig. 2 is a plan view of Fig. 1 according to the first embodiment;

Fig. 3 is a view showing a state of lowering the heel to brake according to the first embodiment;

Fig. 4 is a view showing a state of raising the heel and pushing with the toe to brake according to the first embodiment;

Fig. 5 is a side view of a state during skating according to the second embodiment;

Fig. 6 is a plan view of Fig. 5 according to the second embodiment;

Fig. 7 is a view showing a state of lowering the heel to brake according to the second embodiment;

Fig. 8 is a view showing a state of raising the heel and pushing with the toe to brake according to the second embodiment;

Fig. 9 is a view showing a state of lowering the heel to brake according to the third embodiment;

Fig. 10 is a view showing a state of raising the heel and pulling the front shaft upward to brake the rear wheel according to the third embodiment;

Fig. 11 is a view showing a state of raising the heel to brake the front and rear wheels according to the fourth embodiment;

Fig. 12 is a side view according to the fifth embodiment;

Fig. 13 is a side view according to the sixth embodiment; and

Fig. 14 is a view showing a state of lowering the heel to brake according to the sixth embodiment.

Explanation on Reference Numerals

10, 20, 30:	shoe
11, 21, 31, 51, 61:	plate from which the shoe can be removed
12, 22, 32, 42, 52, 62:	frame
13, 23, 33, 43, 53, 63:	front shaft
14, 24, 34, 44, 54, 64:	rear shaft
15, 25, 35:	guide groove
16:	guide groove
17, 27:	shaft
18, 28:	shaft
29, 39, 49, 59:	movable plate
1A, 2A:	front wheel incorporating a one-way rotary clutch
1a, 2a, 3a:	rear wheel
2B, 3B:	drum
2b, 3b:	drum
1C, 2C:	one-way rotary clutch
1d:	spring support shaft
2E, 3E:	spring
1e, 2e, 6e:	spring

1F, 2F, 3F, 6F: roller

1f, 2f, 3f, 6f: roller

2G, 4G: metal member

2g, 4g: metal member

2H, 4H: shaft

2f, 3h, 4h: shaft

2h: screw

2j, 3j: screw

1M, 2M: metal member

1m, 2m, 3m: metal member

1N, 2N: brake rubber member or brake shoe

1n, 2n, 3n: brake rubber member or brake shoe

2Q: shaft

1q, 2q, 3q: shaft

1R, 2R, 5R: spring

1r, 2r, 3r, 5r: spring

2S, 5S: spring

6u: roller to guide belt 6w

6v: roller to guide belt 6w

6w: belt

2z, 4z, 5z: shaft

Best Mode for Carrying Out the Invention

The first embodiment exemplifies a case wherein two shafts are attached to a plate. Regarding Figs. 1, 2, 3, and 4, Fig. 1 is a side view of a state

during skating, Fig. 2 is a plan view of Fig. 1, Fig. 3 is a side view showing a state of lowering the heel and urging a rubber member 1n against the ground to brake, and Fig. 4 is a side view showing a state of raising the heel and urging a rubber member 1N against the ground to brake.

A shoe 10 is detachable from a plate 11. The plate 11 has shafts 13 and 14 integrally, and a roller 1F at its toe portion and a roller 1f at its heel portion. A frame 12 fixes shafts 17 and 18 of wheels 1A and 1a, and has grooves 15 and 16 which guide the shafts 13 and 14, a spring support shaft 1d which supports a spring 1e, and a fulcrum shaft 1q of a metal member 1m which supports the brake rubber member 1n.

During skating, a spring 1r having one end fixed to the frame 12 supports the metal member 1m at a horizontal position. Similarly, during skating, a spring 1R having one end fixed to the frame 12 supports a metal member 1M, which supports the brake rubber member 1N, at a horizontal position about the shaft 17 as a fulcrum. The wheel 1A incorporates a one-way rotary clutch 1C which acts on the shaft 17.

The shafts 13 and 14 are combined with the grooves 15 and 16, the frame 12 supports the plate 11, and the spring 1e urges the shafts 13 and 14. As the spring 1e urges the plate 11 against the frame 12, during skating, the barycenter can be easily placed

between the two shafts to ensure stability during skating. The spring 1e also serves to prevent the frame 12 from hanging when the skater raises the leg.

When the two shafts are provided, as in this embodiment, the plate 11 can move like a pendulum with respect to the frame 12. When lowering the heel, the plate 11 moves about the shaft 14 as the fulcrum, as shown in Fig. 3. When raising the heel, the plate 11 moves about the shaft 13 as the fulcrum, as shown in Fig. 4. In Fig. 3, the roller 1f at the heel portion pushes the metal member 1m, and the rubber member 1n is urged against the ground about the fulcrum shaft 1q as the fulcrum to serve as a brake. Once the heel rises, the spring 1r restores the rubber member 1n to the skating position.

Similarly, in Fig. 4, the roller 1F at the toe pushes the metal member 1M, and the rubber member 1N is urged against the ground about the shaft 17 as the fulcrum to serve as a brake. Once the heel lowers, the spring 1R restores the rubber member 1N to the skating position.

The second embodiment exemplifies a case wherein a hinge-like movable plate is added, and shows a drum brake which acts on a wheel, and a link mechanism for the brake. Regarding Figs. 5, 6, 7, and 8, Fig. 5 is a side view of a state during skating, Fig. 6 is a plan view of Fig. 5, Fig. 7 is a view showing a state of

lowering the heel and pushing a metal member 2g with a roller 2f at the heel portion to brake, and Fig. 8 is a side view showing a state of raising the heel and pushing a metal member 2G with a roller 2F at the toe to brake.

A shoe 20 is detachable from a plate 21. The plate 21 has a shaft 23 integrally, and a roller 2F at its toe portion and a roller 21f at its heel portion. A frame 22 fixes shafts 27 and 28 of wheels 2A and 2a, a rear shaft 24, and shafts 2h, 2H, 2q, and 2Q, and has a groove 15 which guides the shaft 23. A hinge-like movable plate 29 exists between the plate 21 and frame 22 and connects the shafts 23 and 24.

A wheel 2A incorporates a one-way rotary clutch 2C which acts on the shaft 27. As springs 2E and 2e urge the plate 21 and movable plate 29 against the frame 22, during skating, the barycenter can be easily placed between the two shafts to ensure stability during skating. The springs 2E and 2e also serve to prevent the frame 22 from hanging from the plate 21 when the skater raises the leg.

The brake according to the second embodiment is a drum brake that acts on the wheel. The front and rear brakes are interlocked to form a link mechanism.

A brake portion for the front wheel includes the shaft 2Q, a metal member 2M, a brake shoe 2N, a spring 2R, a screw 2J, a spring 2S, the metal member 2G,

and the shaft 2H. When the roller 2F at the toe pushes the metal member 2G downward, it pulls the screw 2J. The screw 2J pulls the metal member 2M downward about the shaft 2Q as the fulcrum to urge the brake shoe 2N, attaching to the metal member 2M, against a drum 2B which rotates together with the wheel 2A, to apply a brake.

A brake portion for the rear wheel includes the shaft 2q, a metal member 2m, a brake shoe 2n, a spring 2r, a screw 2j, the metal member 2g, and the shaft 2h. When the skater pushes the metal member 2g downward with the heel, in the same manner as the brake portion for the front wheel, braking is applied.

A shaft 2z movably connects the metal member 2G to the metal member 2g to interlock the brake for the front wheel to the brake for the rear wheel.

The spring 2S can adjust the braking degrees of the front and rear brakes.

The third embodiment exemplifies a case wherein the additional plate 29 and brake metal member 2g in the second embodiment are integrated to form a plate 39. Only a rear wheel is provided with a brake. Regarding Figs. 9 and 10, Fig. 9 is a view showing a state of lowering the heel to brake about a rear shaft 34 as the fulcrum, and Fig. 10 is a view showing a state of raising the heel to brake.

When the skater raises the heel, first, the

heel is raised about a shaft 33 as the fulcrum. When a roller 3F comes into contact with a frame 32, the heel is subsequently raised about the roller 3F as the fulcrum to pull the shaft 33 upward about the rear shaft 34 as the fulcrum. This operation urges a brake shoe 3n against a drum 3b to brake.

In the third embodiment, a spring 3E and spring 3r serve to draw the plate, which serves as the spring 1e of the first embodiment and the springs 2E and 2r of the second embodiment, toward the frame.

The fourth embodiment exemplifies a case wherein a front brake is added to the third embodiment. Referring to Fig. 11, a shaft 4z attaches to the plate 39 of the third embodiment to form a plate 49. The plate 49 movably connects the shaft 4z to a metal member 4G. The fourth embodiment operates in the same as or similar to that in the second and third embodiments.

The fifth embodiment exemplifies a case wherein a shaft 5z serves as both a shaft 43 and the shaft 4z of the third embodiment. The shaft 5z links to a plate 51. Referring to Fig. 12, when the skater raises the heel, a shaft 5z is pulled upward about a shaft 53 as the fulcrum. When the skater lowers the heel, the shaft 5z is lowered about a shaft 54 as the fulcrum. This operation brakes the front and rear

wheels simultaneously. Springs 5R and 5r draw the plate 51 toward the shafts 53 and 54.

The sixth embodiment exemplifies a case of interlocking front and rear brake portions by using a belt in place of a link mechanism as in the second, third, fourth, or fifth embodiment. Referring to Figs. 13 and 14, a belt 6w connects the front brake portion to the rear brake portion. The belt is slightly strained.

A plate 61 to which the shoe is to attach has two levels of front rollers 6F and two levels of rear rollers 6f. When the skater raises or lowers the heel, the rollers 6F or 6f pull or urge the belt 6w to apply the front and rear brakes. A spring 6e presses shafts 63 and 64 to urge the plate 61 against a frame 62. According to this embodiment, the tension acting on the front and rear brakes is constant, and the brake can be made lightweight.

This embodiment can also be practiced by omitting the front shaft and connecting the plate to the frame with only the rear shaft, and reducing the two-level rollers of each of the rollers 6F, the rollers 6f, and rollers 6u to one-level roller. This can further reduce the weight. In this case, although braking can be performed only by lowering the heel, the same braking effect can be obtained.

The sixth embodiment can also be effected by linking the belt 6w from the front brake directly to the shoe or the toe portion of the plate 61 to which the shoe attaches, and linking the belt from the rear brake directly to the heel portion.

In this case, the belt can be shortened, the rollers 6F and 6f can be omitted, and the number of rollers 6u can be decreased to achieve further weight reduction. It is preferable to incorporate a spring 6s which adjusts the braking timings of the front and rear brakes and their tensions.

Industrial Applicability

To use a sporting gear such as a conventional roller skate or in-line skate, advanced techniques and skills are required. Because of the characteristics of the sporting gear that the wheels freely rotate anytime, it is difficult to adjust the balance while skating. Even to stop motionless at the spot is unstable and requires sufficient practice.

Particularly, a beginner skater often loses his balance. Even when the skater loses his balance only slightly, the wheels rotate against his will, and his leg slides forward or backward, leading to a fall. To prevent the fall, the slight loss of balance must be detected. When the wheels are to rotate against the skater's will, the rotation must be stopped immediately

to prevent the skater from falling.

The present invention solves these drawbacks. By incorporating the multi-shaft mechanism, one-way rotary mechanism, and brake interlocking mechanism according to the present invention, anyone can adjust the balance and stop easily without requiring advanced techniques and skills. Hence, the stability improves greatly.

Because of the stability, anyone can use this sporting gear as a simple, easy sporting gear to enjoy skating when going to a playground and the like with the family members and friends. A sporting gear is thus provided that people of a larger number of age groups than before can use easily.

This skating gear is compact. For example, a car trunk can store the skating gears for all the members.

The present invention can allow expectation for an increase in number of people who enjoy sports to lead to a larger number of healthy people.